Space Weather Technical Forecast

Issued on Sunday, 07 April 2024 at 01:13 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: No significant activity.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Low with a peak flare of C1.6 observed at 06/0121 UTC from the northeast limb. There are six sunspot regions on the visible disc. The largest is AR3628, and has recently seen some small flux emergence to develop a bipolar configuration, however this appears to have stalled. The other regions remains small and simple.

No Earth-directed CMEs have been observed.

Solar Wind / Geomagnetic Activity: Solar wind was slightly enhanced due to a combination of the receding fast wind of CH16/- coupled with a likely weak passing transient. Observed speeds by DSCOVR were slightly elevated at 400-500km/s, while the density was around average. Total Interplanetary Magnetic Field (IMF) strength, Bt, was initially Moderate, with a peak of 9nT observed at 06/0215UTC, before easing to be mainly weak at 5-7nT. The north-south component, Bz, was weak and mostly negative (southward), with minimum -8nT, and only brief spells of positive (northward), with maximum +5nT. Phi angle was mainly negative (towards the Sun). Geomagnetic activity was Quiet to Unsettled (Kp 1-3).

Energetic Particles / Solar Radiation: High energy proton flux (greater than 10MeV) observed at GOES-18 was at background. High energy electron flux (greater than 2MeV) observed at GOES-16 was Background to Moderate, peaking 315 pfu at 06/1625 UTC. The associated 24-hour fluence remained well below the Active (1e8 integrated flux) threshold, with a value of 6.69e6 integrated pfu at 07/0000UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Very Low activity is expected through the period, with a slight chance of rising to Moderate with isolated M-class flares. This risk likely increasing a little through the period.

Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs. Solar wind speeds are slightly elevated at between 400-460km/s, from the waning fast wind enhancement and recent weak transient, with a declining trend likely day 1-2 (07-08 Apr). The next enhancement is coronal hole 20, this most probably connecting later day 2, with ongoing effects on day 3 (08-09 Apr). Geomagnetic activity is forecast to be mainly Quiet with Unsettled intervals, but increasing to Unsettled with Active intervals day 2-3 with any fast wind enhancement.

Energetic Particles / Solar Radiation: High energy proton flux as observed by GOES-18, is expected to persist at background. High energy electron flux at GOES-16 is expected to continue at Background to Moderate day 1-2, but likely easing towards more persistent background day 3, after the fast wind arrival from CH20. The associated 24 hr electron fluence is expected to remain below Active.

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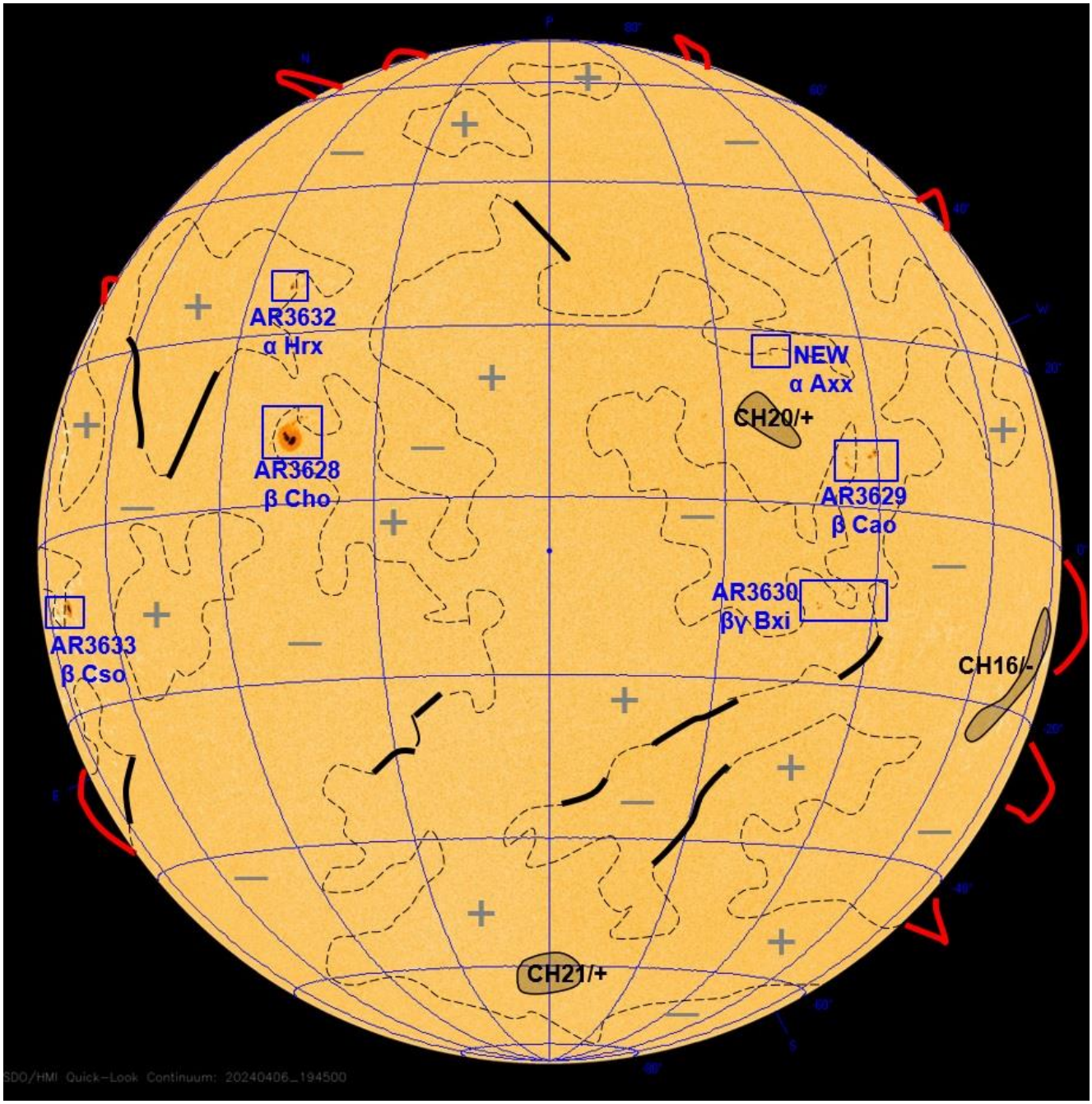
Figure 1. Solar Analysis Valid 06/20000 UTC.



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Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

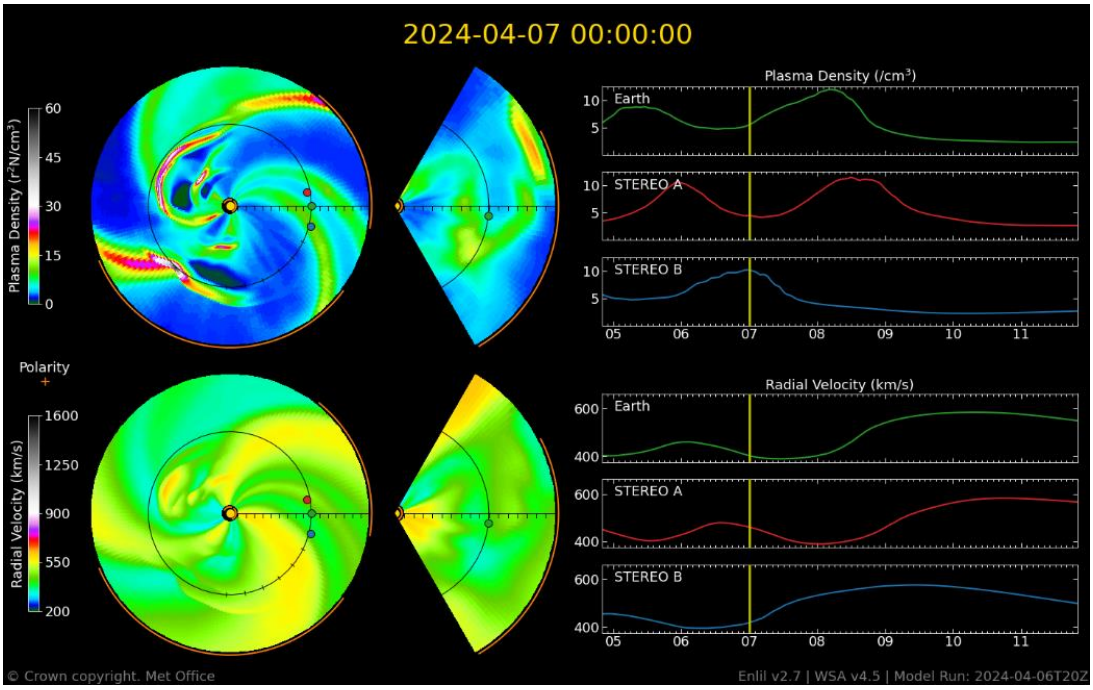
No Earth-directed CMEs.

Solar wind speeds are slightly elevated at between 400-460km/s, as weak transient influence and recent fast wind enhancements ease. The next enhancement will be the arrival of the fast wind CH20/+, in northwest, most probably connecting later on day 2 (08 Apr). This a weak, recently developed feature with the strength and timing of any connection currently low confidence. Current MOSWOC Enlil expectations are considered likely overdone, with peak winds most likely around 450-500 km/s. Any associated fast wind will likely ease later day 3 and day 4 (09-10 Apr)

Mainly Quiet geomagnetic is expected, with a slight chance of Unsettled intervals, but with a spell of Unsettled to Active possible with the onset of any coronal hole fast wind day 2, perhaps continuing into day 3 (08-09 Apr).

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	5	5	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Figure 2: MOSWOC Enlil, showing a much stronger enhancement to CH20 than currently anticipated.



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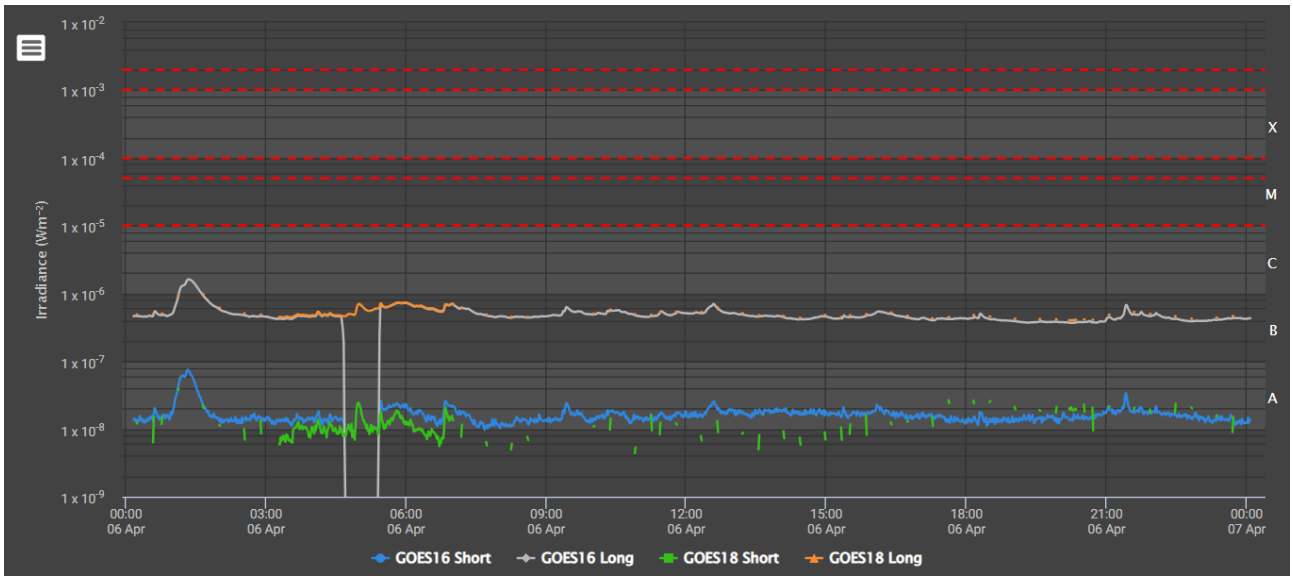
Radio Blackouts - X-Ray Flares:

Low activity is expected, with a likelihood of further C-flares and a slight chance of isolated M-class flares.

There are six sunspot regions on the visible disc, all of which are relatively small with only limited development occurring. The most magnetically complex is very small spot AR3630, which has a beta-gamma configuration due to the mixed polarity of its small component spots. AR3628 in the northeast has also developed a negative polarity leader spot, however any growth of this has currently stalled. AR3633 recently rotated onto the southeast limb but appears to be a relatively simple bipolar group set within plage. While the east limb also has a number of other bright flux sources on SDO imagery, these are mostly showing themselves as plage regions as they rotate on, however there remains the potential for further spots to become apparent.

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	15	20	25	30
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 3: GOES16/18 X-ray flux



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Solar Radiation Storms - (High Energy Protons):

High energy proton flux as observed by GOES-18 is at background and expected to persist at this levels with none of the visible active regions bringing a risk of significant proton rich flares.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	1	1	1	1
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

High energy electron flux observed by GOES-16 is likely to vary between Background and Moderate days 1-2 (07-08 Apr), before perhaps dropping to be more persistently Background day 3 (09 Apr) onward. This would be in response to the fast wind arrival from CH20. Only a minimal connection to this feature is expected however, with flux likely persisting at or near background thereafter.

The associated 24 hour electron fluence is expected to remain below the Active threshold, with REFM currently giving good guidance for expected conditions.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ 2 MeV ≥ $1x10^8$	No	1	1	1	1
Very Active	≥ 2 MeV ≥ $1x10^9$	No	1	1	1	1

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